



# Conveying Warnings and Public Response

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## The Warning Response Process



## Warning Decision Training Branch

Welcome to this lesson on the warning response process. This lesson, which should last about 20 minutes, addresses the general social-psychological process that people go through from the time a warning is first heard to the time people respond.

My name is Dale Morris and I am joined in this lesson by Chris Spannagle.

# What response do you want?

- May 3, 1999
  - Man crawls into sewer
  - People left shelter and went to a highway overpass
  - Hospital patients moved into hallway before rooms filled with debris
- May 4-10, 2003 – Missouri Emergency Management:  
*"There were no surprises."*
- Is success in a warning event defined by FAR, POD, and Lead Time?



What things can a warning forecaster do to get the desired response from the public? A man in the path of an F5 tornado actually crawled into a sewer to escape injury. During this same event, others left safe shelter to go to a highway overpass. Later this same day, patients in a rural hospital were moved into a hallway after communication between the hospital and their local emergency manager. Their rooms eventually were filled with tornado debris, but the patients sustained only minor cuts and scratches. The hospital eventually was condemned and torn down. In Missouri, emergency managers were able to move road crews out of the way of an F4 tornado.

What happened in these situations, and what did NWS forecasters do to elicit these responses? Objective metrics like FAR, POD, and Lead Time only partially measure the success of a warning event.

# Overview

- What is the social-psychological process that people go through from the time a first warning is heard to the time people respond?
- What factors influence the response?

"Understanding human behavior is at least as hard as understanding and predicting the atmosphere."

- Dr. Eve Gruntfest

Director Social Science Woven in  
Meteorology (SSWIM) Program  
University of Oklahoma



Although there is not a lot of research linking warnings and behavioral response, much of the research that does exist shows that there is a process that takes place between hearing the warning and reacting. Programs like WAS\*IS, (Weather and Society Integrated Studies) are helping to answer questions related to the end-to-end warning process. New research is trying to get a glimpse into what people were thinking during certain responses to warnings and other environmental stimuli (like deciding to drive through a flooded roadway).

Depending on how the warning is crafted, the sender of the warning message can impact the actions of the receiver. Therefore, it is important for forecasters that issue warnings to understand the process people generally go through prior to responding to the warning message.

# Learning Objectives

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1. Identify the common process between a person hearing the initial warning and responding.
2. Identify the most common sources of warning information.
3. Identify methods forecasters can use to impact the actions of warning recipients.

This lesson has three objectives.

# Inputs into a Warning Response

Do Weather Warnings Outweigh Need To Go To Work?



For someone at a particular time, ignoring a warning to go to work may be a perfectly rational decision.

You may have seen a graphic similar to this relating to how forecasters weigh the sum of all inputs in making a warning decision. In an analogous way, individual people probably weigh various factors when they make decisions. A weather warning may be one piece of information that may be seemingly logically and rationally over-ruled by other competing thoughts and emotions.

For instance, consider someone who is at home and is about to leave for work and has received a weather warning message via TV, a telephone call and a text message. However, this person also has had tension on the job because of a looming work deadline and an argument with the boss. Add to that other personal issues like debt collectors or child care or medical expenses, and the pressure to go to work for fear of losing the job may overpower the weather warning. Of course, one important factor that may be excluded from this decision-making process is that the job doesn't matter if the worker dies trying to get to work!

# The Warning Response Process

- Hearing
- Understanding
- Believing
- Personalizing
- Deciding and Responding
- Confirming



Photo by Chris Spannagle

People don't just hear a warning and immediately take action. There is a process that takes place between hearing the warning and reacting. That process can take only a few seconds or several minutes.

People go through a more or less sequential process in which they consider various aspects of the decision confronting them before acting. The sequence may not be the same for every person, and each stage is not necessary for a response to occur.

Importantly, the behavioral outcomes of the public are impacted by both the sender (issuing the warning), the receiver (those hearing the warning), and other intermediate factors.

# The Warning Response Process

- Hearing
  - Most people get warnings via TV
    - Interpretation (or misinterpretation?)
    - Presentation
  - Time of day
    - Less likely to hear at 3AM



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It can't be assumed that just because a warning is broadcast that people will hear it. Most people receive NWS warnings over the television. NWS forecasters must partner closely with the local media to ensure the warnings are transmitted accurately and in a timely fashion. NWS Directive 10-1801 specifically addresses this aspect, encouraging the media to participate in drills to test all aspects of the integrated warning system.



# The Warning Response Process

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- Community Preparedness
  - Sirens
  - Alert System
  - StormReady



The level of community preparedness also plays a large role in the warning response process. NWS offices can and should help to increase community preparedness. In fact, NWS Directive 10-1801 states that “NWS offices should conduct training sessions for hazards community members so they know how to use our services and how to integrate them into their decision processes.” Another way to increase community preparedness is through the Storm Ready program. Storm Ready is a program aimed at preparing cities, counties, towns and universities across the nation with the communication and safety tools necessary to save lives and property.

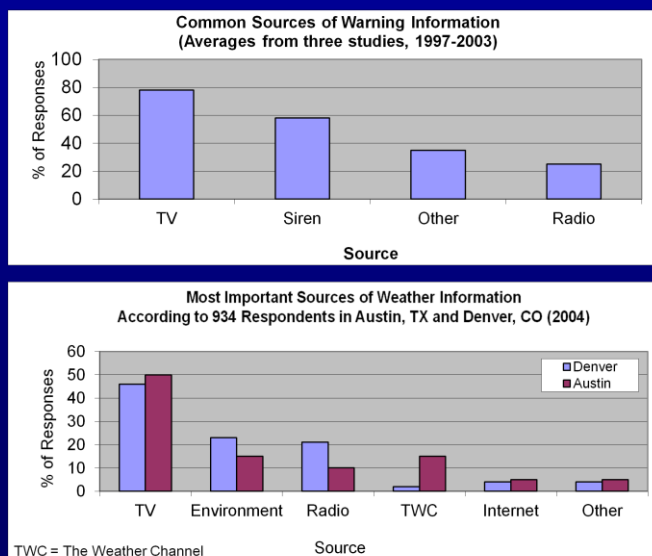
This program has several requirements in order to be certified as Storm Ready:

- Establish a 24-hour warning point and operations center
- Create a system to monitor local weather conditions
- Have the ability to receive severe weather forecasts and warnings and alert the public through multiple methods
- Promote the significance of public readiness through community seminars
- Develop a formal hazardous weather plan, which includes training severe weather spotters and holding exercises



# The Warning Response Process

Past studies on ways the public receives warning and weather information.



Recent studies show that TV is both the most common source of warning information and considered to be the most important source of weather information.

The top figure shows common sources of weather information obtained from three separate studies which took place between 1997 and 2003. These three studies consisted of a study by Hammer and Schmidlin in 2002 with 190 people affected by the May 3<sup>rd</sup> 1999 Oklahoma City tornado. Another by Balluz et al. questioned 146 participants affected by tornadoes in Clark and Saline counties in Arkansas on March 1, 1997. A third study, consisted of 129 respondents affected by tornadoes in parts of Kansas, Missouri and Tennessee on May 4<sup>th</sup>, 2003. The figure clearly shows that television and sirens are by far the most common ways people obtain warning information.

The bottom figure shows rankings of what people considered to be the most important source of weather information according to a 2004 study by Hayden et al. which took place in Austin, TX and Denver, CO. This study again shows that TV is considered to be the most important source of weather information, with environmental clues and AM/FM radio ranked second and third.

# The Warning Response Process

- Understanding
  - Preparation
  - Climatology of event
  - Demographics
    - Older
    - More mobile
    - More diverse
    - More Spanish speaking

“... the value of being able to write warnings that are most meaningful to various segments of populations is also a growing need with tremendous benefit possibilities.”  
- Dr. Eve Gruntfest  
Director Social Science Woven in Meteorology (SSWIM) Program  
University of Oklahoma

After hearing the warning, the listener must understand the warning. The capability of the public to understand the warning has a lot to do with preparation. It is not just the duty of the Warning Coordination Meteorologist to educate and prepare the public. This is a huge task, the job is never done, and the entire NWS organization needs to help.

The public's understanding is also impacted by the climatology of the event. For instance, the public's understanding of a severe thunderstorm warning is better in areas where severe thunderstorms are more common.

Finally, it is probably incorrect to think of a single monolithic “public”. In fact, there are many publics. Demographics play into understanding. In 2000, one in eight Americans was over age 65. By 2030 one in five Americans will be 65 or older. The increasing Spanish speaking population especially in the South Central and Southwestern U.S. also is an issue in understanding warnings.

# The Warning Response Process

- Believing
  - Shift away from belief in “official” warnings
  - Public weighs several factors prior to deciding whether to react
    - Perceived susceptibility
    - Appraised severity of threat
    - Belief in positive outcome from response



Does the “cry wolf” syndrome have a major impact on believability?

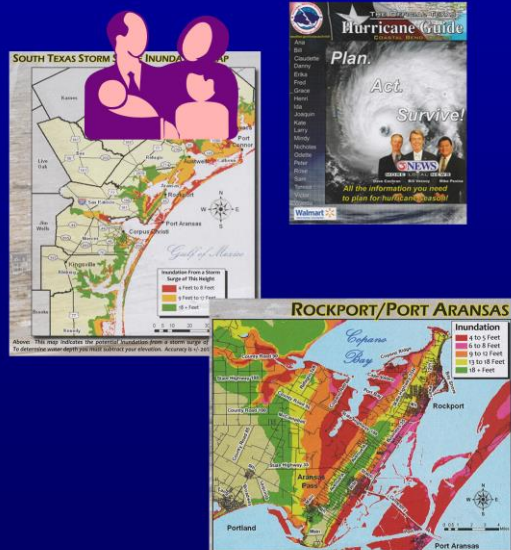
The warning may be heard and understood, but is it believed? Recent findings show that public reliance on “official” warnings from traditional sources may be shifting to more private and informal sources. (Baker 1995; Dow and Cutter, 1998; Drabek, 2001). People use new, previously unavailable sources of information and weigh several factors in their decisions about whether, how, and when to react to hazardous conditions.

The classic referenced case is the “cry wolf” syndrome. Most studies have not found evidence of a direct link between previous false alarms and the credibility of warnings. However, one recent study by Simmons and Sutter has found an increased likelihood of fatalities in areas that previously have had a higher incidence of false alarms for tornado warnings. Nevertheless, this is a complicated issue because areas with more warnings probably have more tornadoes and thus more injuries or deaths. In their work, Simmons and Sutter did recognize there is a tradeoff between our detection and warning capabilities and false alarms. For another perspective on the false-alarm issue, a very limited sample of interviews were conducted as part of a recent NWS service assessment. According to the assessment, “Many of those interviewed, including EMs and other public officials, mentioned that they have been under numerous tornado watches and warnings where ‘nothing happens.’”

Believability can be influenced by many factors associated with the method and contents of the warning. Later portions of this presentation will focus on how the warning forecaster can influence believability.

# The Warning Response Process

- Personalizing
  - Level of community interaction
  - Family composition
  - Length of residency
  - Emergency risk perception
    - Prior experience
    - Perceived proximity
    - Observation



People think of warnings in personal terms—what are the risks for themselves and family? The perception of risk is an important step in responding to a warning. If they feel “it can’t happen to me”, they may well ignore a warning. The ability of the public to personalize the threat is to some degree set prior to the warning event. If an area has recently been hit by severe weather, the public will be much more likely to personalize the threat than people in an area that has not been threatened for several years.

Through various outreach and public education efforts, the NWS can influence how people perceive risk and their vulnerability to hazardous weather. As one example, all four WFOs that serve the Texas coast (the Lake Charles, Houston, Corpus Christi and Brownsville offices) have partnered with the State of Texas, local media and emergency managers, the American Red Cross, a non-profit organization, and a major retailer to produce and distribute 1.1 million full-color 32 page Hurricane Guides in English and Spanish. One of the sections in the guide includes regional and local storm surge inundation maps which can help local residents assess their vulnerability to storm surge.

The next slide contains a video that provides an example from a broadcast

media perspective of a viewer personalizing a tornado warning .

# The Warning Response Process

- Personalizing: Example from a broadcast media perspective



Dave Freeman  
Chief Meteorologist  
KSNW-TV, Wichita, KS

For some time, the KSN WeatherLab in Wichita was co-located at a children's science center. We were right there doing all of our broadcasting including severe weather coverage in front of the public.

So one day, we have a tornado warning for downtown Wichita. The children's museum staff did their job. They executed their safety plans. They got on the PA system and informed everybody they needed to evacuate to the shelters in the other part of the complex. Pretty soon, there's nobody here. We're still doing our coverage.

All of a sudden, here comes this dad and his couple of kids just kind of walking around the corner. They sit down in the bleachers and proceed to watch. And I'm talking about the tornado warning and how everybody in downtown Wichita should be in shelter. They're not moving. So I said, "Everyone at Exploration Place should be in shelters, should follow the severe weather safety plan because we have a tornado warning." Nothing. They didn't move.

So finally, I actually kind of had to stop my broadcast, and I looked right at this guy, and I said, "Sir, I'm talking to you. There's a tornado warning for



downtown Wichita. You need to move to shelter.”

And this is what I saw. “Ohhh!”. And the guy jumps up, grabs his kids, and tears out of there to go to the shelter.

Now, I’ve never forgotten that moment because, in that moment, I was able to actually see the process that is taking place for people at home. I see him kind of going from the “Oh, isn’t this interesting” to “Oh my! That’s really possibly could be really affecting me, and oh my gosh, I had better do something about it!” And it just reinforces the fact that this is a process and that we have to help people at home get through that process of recognizing that there’s a threat, personalizing the threat, and then taking action to protect their families.

# The Warning Response Process

- Confirming
  - Response is a consequence of a series of decisions
  - Most actively seek out additional information
    - Call friends and relatives
    - Go outside and observe
    - Change TV channels



"When warning information is received, most people try to verify what they heard by seeking out information in another warning message or from another warning source or person."

-Dr Dennis Mileti

Senior Research Scientist Natural Hazards Research and Applications Information Center

People are information hungry following the receipt of warnings. This can mean turning the TV to another station, checking with a neighbor, friend or family member, or going outside to look at the sky.

There is a need for a continuous flow of information. Even statements that repeat previously available information can help confirm the threat. That confirmation helps people better understand warnings, believe them, personalize the risk, and make response decisions. Because people confirm warnings and receive information from multiple intermediate sources, it is critically important that the continuous flow of information from various media sources as well as various state, local, and federal government officials contains consistent messages.

# The Warning Response Process – Case Study

Tornado Strikes Caledonia High School January 10, 2008

- Hearing
- Understanding
- Believing
- Personalizing
- Deciding and responding
- Confirming



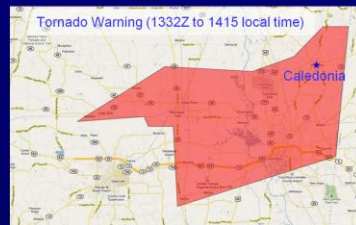
Here is a recent example of a warning response process lifted from the pages of the March 2008 NOAA World Newsletter.

Understanding the behavioral aspects of the warning response process can help shape better warnings leading to a better outcome. In this case, an EF3 tornado heavily damaged a school complex in Caledonia, MS, on January 10, 2008, but a timely warning, a NOAA Weather Radio receiver, a prepared principal, and several phone calls from the county EM kept as many as 2140 students and employees from harm.

# The Warning Response Process – Case Study

Tornado Strikes Caledonia High School January 10, 2008

- Hearing
  - Received Tornado Warning 41 minutes before-hand through NOAA Weather Radio
  - Specifically mentioned Caledonia



In this case, the hearing aspect was from NOAA Weather Radio and a warning that specifically mentioned the city of Caledonia (shown by the blue star in the warning image). Studies have shown that less than five percent of the population receive warnings from NOAA Weather Radio with most receiving warnings from TV and radio. Most of the nation's workforce do not have access to TV and radio at work. The local office led by the WCM can target workplaces to educate management at those sites of the cost benefit of a weather radio.

# The Warning Response Process – Case Study

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Tornado Strikes Caledonia High School January 10, 2008

- Hearing
- Understanding
  - High School Principal perceives the school is under the threat of a tornado and activates tornado safety plan



Experience and training made understanding of the warning nearly instantaneous at the Caledonia school complex. A tornado warning activated the schools' tornado safety plan, sending students and employees to their designated shelters.

# The Warning Response Process – Case Study

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Tornado Strikes Caledonia High School January 10, 2008

- Hearing
- Understanding
- Believing
  - Heard tornado sirens activate
  - Placed students in gym locker room and another interior room



In this case, the principal concluded it was time to take shelter within seconds of hearing the Tornado Warning was issued. The strong wording in the tornado warning, stating that the storm was capable of producing strong to violent tornadoes and that this was an extremely dangerous and life threatening situation, also helped to impart the seriousness of the situation and lead the principal to the conclusion that the threat was real.

# The Warning Response Process – Case Study

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Tornado Strikes Caledonia High School January 10, 2008

- Hearing
- Understanding
- Believing
- Personalizing
  - Storm Ready
  - Safety presentations to students
  - Appropriate shelter locations identified and marked
  - School had participated in state-wide tornado drill



Caledonia is located in Lowndes County, MS which has been certified as a Storm Ready community. As part of the certification process, the school participated in state-wide tornado drills, severe weather awareness week and received several severe weather safety presentations. These experiences resulted in the development of a strong safety plan, clearly marked shelter locations and receipt of a NOAA Weather Radio.



# The Warning Response Process – Case Study

Tornado Strikes Caledonia High School January 10, 2008

- Hearing
- Understanding
- Believing
- Personalizing
- Deciding and responding
  - Due to long lead-time moved students to safer areas
  - Accounted for all students and employees after event and surveyed property



The decision to seek shelter is not made upon hearing a warning. Studies have shown that a warning must be understood, believed, personalized, and confirmed before a decision is made to respond. In this case, a lead-time of 41 minutes allowed for the principal to move students and employees from nominally safe areas to safer areas of the main building on campus.

# The Warning Response Process – Case Study

Tornado Strikes Caledonia High School January 10, 2008

- Hearing
- Understanding
- Believing
- Personalizing
- Deciding and responding
- Confirming
  - Received two personal phone calls from county EM
  - Gymnasium and adjacent building severely damaged
  - School bus tossed onto roof of gymnasium



The receipt of the tornado warning through NOAA Weather Radio, sirens and television sent all students and employees to their designated shelters. Two phone calls from the county emergency manager further confirmed the threat and allowed for everyone to be moved to safer shelters. The final confirmation, in this case, was when the tornado struck the school complex.

# The Warning Response Process – Case Study

Tornado Strikes Caledonia High School January 10, 2008

## What Happened?

- EF 3 Damage at school
- 2140 people in school complex at time of tornado
- 3 minor injuries and 0 deaths



So what happened with this event?

An EF3 tornado struck the city of Caledonia and more specifically the Caledonia High School complex at about 2:13PM CST which is roughly 41 minutes after the first tornado warning was issued. Damage at the school complex consisted of the almost total destruction of a gymnasium in which some students were initially sheltered. A school bus was thrown onto the roof of a Vocational Tech building located adjacent to the gymnasium where other students had initially been sheltered. Cars and other school buses were flipped over and the football press box and concession stands were destroyed. At the time the tornado struck, approximately 2140 students and employees were on the campus: none were killed and there were only three minor injuries. Elsewhere around town, numerous trees were snapped and uprooted, many homes sustained roof damage and/or collapsed walls.

# What Can Forecasters Do To Impact Warning Response?

- Include Reports in Warnings
- Use Well-Known and Unambiguous Geography
- Apply Enhanced Wording When Appropriate (Rare)
  - Significant Event
  - Particularly Dangerous
  - Tornado Emergency
  - Potentially Deadly

LAW ENFORCEMENT REPORTED TREES DOWN ON POWER LINES IN PONTIAC. THESE STORMS HAVE A HISTORY OF PRODUCING WIDESPREAD WIND DAMAGE. SEEK SHELTER NOW AND STAY AWAY FROM WINDOWS.

HAIL UP TO ONE INCH IN DIAMETER HAS BEEN REPORTED IN WESTERN PARTS OF LOUISVILLE METRO WITH THESE STORMS.

THIS INCLUDES INTERSTATE 65 BETWEEN MILE MARKERS 82 AND 108. THIS INCLUDES INTERSTATE 70 BETWEEN MILE MARKERS 89 AND 98. THIS INCLUDES INTERSTATE 74 BETWEEN MILE MARKERS 93 AND 114.

IN ADDITION...INTERSTATE 71 AT US ROUTE 127...EAST ENTERPRISE...PATRIOT...US ROUTES 42 AND 127 AT STATE ROUTE 562 AND NORTH LANDING ARE NEAR THE PATH OF THIS SEVERE STORM.

...A TORNADO EMERGENCY FOR GREENSBURG...

What can warning forecasters do to influence the warning response?

Including actual and credible reports with the source of the report in the warning text can increase the believability of the warning.

Using well known and unambiguous geography helps the personalization process. The automated geographic specification of county sections in storm-based warnings can seem ambiguous and not clear to some residents. For example, individuals may not realize they are in northern Washington County, but they may know they are north of Highway 15.

Finally, in rare situations, applying enhanced wording in warnings can draw attention to the most significant of events. For example, specific policy guidance is available in Directive 10-511 about using “tornado emergency”: **In exceedingly rare situations, when a severe threat to human life and catastrophic damage from a tornado is imminent or ongoing, the forecaster may insert the headline "...TORNADO EMERGENCY FOR [GEOGRAPHIC AREA]...".** Additionally, in such a situation, this headline should only be used when reliable sources confirm a tornado, or there is clear radar evidence of the existence of a damaging tornado such as the observation of debris.

# Summary

## The Warning Response Process

- Hearing
  - Intermediate sources (TV)
- Understanding
- Believing
  - Actual reports
- Personalizing
  - Unambiguous Geography
  - Enhanced Wording
- Deciding and responding
- Confirming



In summary, a warning forecaster's understanding of the behavioral warning response process can result in a positive response by the public. Also, knowing that most people receive warning information through intermediate sources (such as broadcast media or other government officials) means that partnerships should be worked out well in advance of an event to ensure message consistency. Finally, specific wording in warnings and follow-up statements can help people to believe and personalize the warnings.

Which of the following is a true statement concerning research on behavioral response to warnings?

- People weigh several factors in their decision about whether, how, and when to react to warnings
- Most people take shelter immediately after hearing a warning
- Those who see warnings and warnings have any role in the response of those hearing the warning
- Warnings of nuclear war have a direct link between previous false alarms and the credibility of warnings ("cry wolf" syndrome)

## AWOC Core, IC4, Lesson2 - The Warning Response Process

Quiz - 3 questions

Last Modified: Apr 14, 2015 at 04:30 PM

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# End of Lesson

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“The Warning Response Process”?  
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You have completed this lesson on The Warning Response Process.

For more information you can consult the list of references attached to this presentation. You can access these references by clicking on the “Attachments” button at the top right of this presentation window.

Please complete the remaining lesson in this Instructional Component before attempting the test required for completion. The test should be taken as soon as possible after completing all of the lessons.

If you have any questions about this lesson, first ask your SOO. Your SOO is your local facilitator. If you need additional help, please send an e-mail to the address listed on the slide. Thank you for your time and good luck on the exam!